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DOMINION DENTAL JOURNAL.

VOL. VI.

TORONTO, SEPTEMBER, 1894.

No. 9.

Original Communications.

Hereditv and Environment, Beginning with the Primordial Cell.*

By D. V. BEACOCK, Brockville, Ont.

It has been said, "The child is father to the man," and that if we would comprehend a character, we must trace his birth, his surroundings, the method of his growth, the forces that have shaped him and made him what he is.

The past is fixed; the future lies before us like the block of rough marble before the sculptor. It can be shaped into beautiful designs according to his tastes and fancies, or left untouched with all its beauty and usefulness undeveloped.

The famous inscription of the Oracle of Delphi said, "Man, know thyself." And to do this thoroughly, we have not only to know ourselves but our ancestors as well, and the best way to do this is to begin at the very commencement of life, the primordial cell or germ. We shall then be able to get at the root of health and disease—heredity and environment—the latter two factors having a great deal to do with man's proper development, happiness and misery.

In order that we may properly comprehend the great importance of heredity, it will be necessary to review some of the elementary principles of organic and inorganic nature.

The verdict of modern thought is almost unanimous in asserting that there was a time when the material universe was in a chaotic state—that it was without form; in other words, in a nebulous

* I am indebted to Prof. Huxley and Dr. Holmes for many valuable ideas in this paper.

condition, when the plastic material had been created but the magical touch of the Supreme Intelligence had not yet moulded the chaos into wondrous designs that now furnish food for the souls of finite beings. Architecture was then unknown, and without architecture of what use were the materials—the soft clay or the perfect marble? Beauty and utility were yet latent. But ere long the designs and specifications of the Supreme Architect were revealed, and the product of two mighty forces—vital and physical—by the union of mind and matter, produced a living cell. The Great Architect had united the material with the immaterial, the visible with the invisible, and out of the chaos of a dead universe there evolved the greatest mystery of creation—life.

Now, let us take a retrogressive step and look back into the synthesis of living beings. No analytical or synthetical chemistry can give us the origin of life or tell us what it is. The principle that gives the inert mass the power of life is the secret of the Creator, and will never be comprehended by the finite mind of man. What life is, no one knows. It is said to be the result of the activity of the cells. Now, a cell is the lowest form of life, both animal and vegetable, and from these single cells all life is produced.

Let us examine a simple living cell. If we study it carefully we shall find that it is composed of an unresponsive, powerless mass of protoplasm and a vital force. By the union of these two factors it becomes an independent organism, possessing well-marked functions. This is the first step in the wonderful evolution of life.

Protoplasm (from *protos*, first, and *plasma*, mould, or what has been formed) was first so called by Hugo von Mohl as recently as 1846; and the simplest form of life which first emerges from the inorganic to the organic world consists of protoplasm, or, as Huxley calls it, the physical basis of life. It is a colorless semi-fluid or jelly-like substance, which consists of albuminoid matter. It exists in every living cell, both animal and vegetable. It is just as certain that all individual life, from the most elementary protoplasm up to the highest organism, man, originates in a minute or embryo cell, as it is that oxygen and hydrogen combined in certain proportions make water. Our most delicate means of research throw no light on the purely vital endowments of protoplasm, which not only direct and control its activities, but are transmitted in well-defined characters from parent to offspring. One thing we do know, that there is no life without pre-existing life from which it is derived, and the physical basis through which it acts or is made manifest furnishes no satisfactory explanation as to its real essence and constitution.

It is impossible to procure pure protoplasm for chemical analysis, as it contains many extraneous substances; and even if this could be done, a chemical analysis of living protoplasm cannot be made.

And it is a well-known fact that there is evidence to show that there is considerable difference in the chemical properties of living and dead protoplasm. For instance, carmine and other coloring matters do not color living protoplasm, while on the other hand they give a brilliant stain to dead protoplasm.

To illustrate: Analytical chemistry is the pulling down of substances; synthetical chemistry is the building up of a more or less complicated product from its elementary constituents. For instance, if we heat a little sugar to redness in a test tube it leaves a black deposit, which is carbon, while a liquid, which is water, distils over; and on electrolyzing this fluid we resolve it into hydrogen and oxygen, so that we can thus show that sugar is composed of carbon, hydrogen and oxygen. This pulling down or taking to pieces of sugar (analysis) is an easy matter, but the putting these same elements or pieces together again (the synthesis of sugar) is a very different matter and much more difficult. You may put together carbon, hydrogen and oxygen in due proportions, and shake them all together, or heat them or cool them, and yet you will never get them to combine again so as to make sugar.

The analysis of dead protoplasm, animal or vegetable, is an easy matter, and consists of carbonic acid, water and ammonia. But no chemist has ever succeeded by synthesis, and probably never will succeed in putting these three simple ingredients together again, and thus making protoplasm. Chemical investigation can tell us little or nothing, directly, of the composition of living matter, inasmuch as all such matter must needs die in the analysis. Out of these three simple forms of matter, carbonic acid, water and ammonia, the vegetable world builds up all the protoplasm which keeps the animal world agoing. Withdraw any of these simple elements from the world, and all vital phenomena comes to an end. They are related to the protoplasm of plant life as the protoplasm of the plant is to that of the animal. It will thus be seen that plants are the accumulators of the power which animals distribute and disperse. We must bear in mind that no animal can make protoplasm, but must take it ready-made from some other animal or plant, the animal's highest feat of constructive chemistry being to convert dead protoplasm into that living matter of life which is appropriate to itself. Therefore, in seeking for the origin of protoplasm we have to turn to the vegetable world. The animal can only raise the complex substance of dead protoplasm to the higher power, as one may say of living protoplasm, while the plant can raise the less complex substance, carbonic acid, water and ammonia, to the same stage of *living* protoplasm. The fluid containing carbonic acid, water and ammonia, which offers such a Barmecide feast to the animal, is simply a table richly spread to the multitudes of plants, and, with a due supply of only such materials, many a plant will not only maintain itself in vigor, but grow and

multiply until it has increased a million-fold the quantity of protoplasm which it originally possessed, in this way building up the matter of life, to an indefinite extent, from the *common matter* of the universe.

No matter under what guise it takes refuge, whether fungus or oak, worm or man, living protoplasm not only ultimately dies and is resolved into its mineral and lifeless constituents, but it is always dying, and strange as the paradox may sound, could not live *unless* it died.

Notwithstanding all the fundamental resemblances which exist between the powers of protoplasm in plants and animals, they present a striking difference, in the fact that plants can manufacture fresh protoplasm out of minerals and mineral compounds, whereas animals are obliged to procure it ready-made, and hence, in the long-run, depend upon plants for their supply. At the present time we may look upon protoplasm as the basis of physical life in the same sense that some form of it is the essential and active constituent of every living cell or tissue, whether vegetable or animal, and that it is only formed through the physiological activities of living organisms. In the absence of life, protoplasm cannot be formed, and, so far as we can perceive, there are no manifestations of life without it.

Living substance or protoplasm must be looked upon as constantly undergoing changes that vary with the functions required of it. These changes, without attempting to distinguish between them, as chemical, physical, or more strictly speaking, biological, are most conveniently expressed by the general term metabolism, which is both constructive and destructive.

Dr. M. Foster says: "We may picture to ourselves this total change, which we designate by the term metabolism, as consisting, on the one hand, of a downward series of changes (katabolic changes), a stair of many steps, in which more complex bodies are broken down into simpler and simpler waste bodies, and on the other hand, of an upward series of changes (anabolic changes), as also a stair of many steps, by which the dead food, of varying simplicity and complexity, is, with the further assumption of energy, built up into more and more complex bodies. The summit of this stair we call protoplasm."

All work implies waste, and the work of life results, directly or indirectly, in the waste of protoplasm. Every word uttered by a speaker costs him some physical loss, and, in the strictest sense, he burns that his hearers may have light—so much of his body resolved into carbonic acid and urea.* It is one of the funda-

* It is said that urea circulates in the blood, and is excreted by the kidneys, and the more mental work the more urea is produced. A fretfulness that produces activity, but no actual results, causes a loss of just so many grains of urea. Therefore, for every footpound of thought you will have a given amount of urea excreted.

mental doctrines of physiology that every part of our organism has its own definite term of vitality, and that there is a continuous succession of the destruction of old cells and the formation of new ones in all tissues, and especially in those in which the most active vital changes are going on, as, for example, in the nervous and muscular tissues. Even the most solid portions of the animal frame, such as the bones, and, to a less extent, the teeth, are undergoing a perpetual, although slower change of this nature, and throughout the body there is a continuous removal of effete or worn-out tissues, and a corresponding deposition of new matter. Every blow we strike, every thought we think, is accompanied by the death and disintegration of a certain amount of muscular or nervous tissue as its necessary condition, and thus every action of our corporeal life, from its beginning to its close, takes place at the expense of the vitality of a certain amount of organized structure. This we term molecular* death. It must be clear to every intelligent mind that this process could not go on forever without the capacity of being repaired.

We therefore have recourse to food to supply the waste. Broadly speaking, the animal body is a machine well adapted for converting potential energy into actual energy. The potential energy is supplied by the food we eat; this the metabolism of the body converts into kinetic or actual energy of heat and mechanical labor. So we may say that our bodies are delicately constructed heat engines.

Energy, like matter, is indestructible and of two kinds—kinetic, or actual, and potential, or positive energy. Our whole life consists but in the transformation of these two different kinds of energy. We procure food which we eat, the greater part of which, under chemical action of various juices of the digestive organs, is absorbed into our system, which thereby enables us to perform a certain amount of work, mental or physical; in other words, to transform a certain amount of potential into kinetic or actual energy. *For a certain amount of work* to be done (without waste or injury to the system), a certain amount of food must be absorbed, that is, digested. If the absorption be in excess of the expenditure, then nature stores this energy up in the form of fat; if the expenditure be in excess of absorption, then nature works upon our bodies and we grow thin. If the absorption equal the expenditure, then we are in a state of what the doctors term physiological equilibrium, in perfect good health.

Energy is expended in building organic substances, or, in other

* Speaking of molecules, scientists state that a cubic inch of oxygen, at ordinary temperature and pressure, contains so many molecules, that a number equal to the population of our globe might escape every second, and it would take over six thousand years to empty this small space. Or if a single drop of water could be magnified to the size of the earth, the molecules would be the size of billiard balls.

words, in converting food stuffs of any kind into protoplasm, the summit of the double stair of life, and its potential energy is the transformed or stored energy of the above mentioned constructive process.

Man, like all animals, is born of an egg, or ovum, which was the first germ of our existence, and is a small cell about one-hundredth of an inch in diameter, consisting of a mass of semi-fluid protoplasm enclosed in a membrane, and containing a small speck or nucleus of more *condensed* protoplasm. This nucleated cell is itself the first form into which a mass of simple jelly-like protoplasm is differentiated in the course of its evolution from its original uniform composition. This nucleated cell is the starting point of all higher life, and by splitting up and multiplying repetitions of itself in geometrical progression, provides the cell material out of which all the more complicated structures of living things are built up. At first the egg behaves exactly as any other single-celled organism, as, for instance, that of the ameba, which is considered the simplest form of all organized life. One of the simplest forms of this is nothing but a naked little lump of cell-matter, or plasma, containing a nucleus; and yet this little speck of jelly moves freely. It shoots out tongues or processes and gradually draws itself up with a sort of wave-like motion; it eats and grows, and in growing reproduces itself by contracting in the middle and splitting up into independent ameba.

Even if a drop of blood is drawn by pricking one's finger, and carefully viewed with proper precautions and under a sufficiently high microscopic power, there will be seen among the innumerable multitude of little circular discoidal bodies or corpuscles which float in it and give it its color, a comparatively small number of colorless corpuscles, of somewhat larger size and somewhat irregular shape. If this drop of blood be kept at the temperature of the body, they will be seen to exhibit a marvellous activity, changing their forms with the greatest rapidity, drawing in and thrusting out prolongations of their substance, and creeping about as if they were independent organisms. This substance which is so active is simply a mass of protoplasm, and its activity differs in detail, rather than in principle, from that of protoplasm of plant life. The simplest form of life, as it emerges from the inorganic to the organic world, consists of protoplasm. In the earliest state of the human organism, in that in which it has just become distinguishable from the egg in which it arises, it is nothing but an aggregation of corpuscles or cells, and every organ of the body was once no more than such an aggregation. Thus a nucleated mass of protoplasm turns out to be what may be termed the structural unit of the human body, and in its most perfect state it is a multiple of such units variously modified and differentiated. Let us look at this little cell, nestled in a con-

genial environment. It is alive, it moves, it comes in contact with small particles of inorganic matter ; it shapes itself so as to surround them, and the little particles are absorbed into its organism and they become a part of the living cell. That function of the cell which enables it to absorb the latent forces of the inorganic matter unto itself, we call nutrition. If we watch it still further, we shall see that it increases in size, it grows. But this little cell we have been studying has yet a still brighter future: it has a latent force within that has thus far been unobserved. Growth is the balance of repair over waste, and when through assimilation of food into its substance, this cell reaches a certain size, the force of cohesion is overcome by the release of the energy derived from food, and the cell divides equally at the kernel or nucleus, the soft slimy protoplasm distributes itself around each nucleus as the two part company, to grow and divide again in like manner *ad infinitum*. You here see the function of perpetual existence has been added—the function of self-preservation, by making two living things out of one: the origin of parent and offspring, the beginning of reproduction.

The fundamental principles of life were embraced in these four functions: nutrition, growth, motion and reproduction. The living cell being completed, it has since been allowed to work out its own destiny. It began to unfold the mysterious possibilities that were concealed within its little structure, and the unnumbered ages have witnessed a mighty growth and development—a wonderful evolution of life.

Thus far we have learned four functions of the organic world—nutrition, growth, motion and reproduction. We find by experimentation that if we diminish the nutrition the growth diminishes and the motion lessens. If nutrition ceases, growth and motion both cease and the cell dies; the two factors that were combined to form the living cell dissolve, and the organism ceases to be. Let us consider the relation these four attributes of organic life bear to one another. Since living organisms can move, grow and reproduce only by means of nutrition, it is evident that they depend upon nutrition for their continued existence. Therefore nutrition is essential to the other three functions, for without it the others would cease to act and the organism would die.

But nutrition and growth cannot be acquired unless the organism exerts itself in selecting food, and subsequently in assimilating it. Thus we learn that without exercise, or the function of motion, the functions of nutrition and growth will cease. Exercise is, therefore, absolutely essential to nutrition and growth. Without the judicious exercise of each function of an organism the other functions will not be normal; with a little exercise of these functions it may simply continue to exist; but when they cease to act, the organism must die.

In life, as in death, decompositions are continually going on. These decompositions are in kind not different, only during life the products of decomposition are removed and after death they remain in the body and thus poison the individual cells—that is, so alter them that their conditions no longer fulfil the requirements of life.

Scientific authorities everywhere are unanimous on this point: *Omnia vivum ex vivo* (all life comes from life), or, as some put it, *Omne vivum ex ovum* (all life comes from an egg), which is only another way of expressing it, as some animals are viviparous and others oviparous.

The germ, in both animal and plant life, is itself simply a detached portion of the substance of a pre-existing living body. Life, therefore, can be produced from a living ancestor only. And the individual as it develops from the egg cell epitomizes the history of the ancestral forms of its species.

Scientifically it seems impossible man can come from such an extremely minute and apparently insignificant speck as the germ constituting all there is in his beginning. We sometimes wonder at the smallness of the egg of the little humming-bird; but even such a shell full of embryonic germs of human beings would be enough to people a city. Think of it! Man, the lord of creation, yet in his beginning such a mere speck that it takes the most cultured eye to discover it and the best microscope to examine! No wonder science stands appalled and scientists sit by as pigmies. We must remember, too, that infinitesimal as is the human egg, it is *not* the germ; this is merely the mass, a comparatively crude mass. The germ within, as with other eggs, is very much smaller. We speak of the egg as a mere speck. What name shall we use to designate the smallness of this germ? Yet, though so small, it is a complete, living, active, complex organization, a cluster of inspired molecules, wonderfully tenacious, and most mysteriously at work from the first of its impregnated life. Molecule after molecule moves toward the surface of this minute cluster, arranging themselves into three distinct tiers like trained soldiers. The potentiality that resides in this human ameba, that is, the ovum already vivified, lays the foundations of the three embryonal sheets so called, the epiblast, the hypoblast and the mesoblast, the enfoldings of which give us the entire system of primal parts. Every time that you have a reproduction of tissue it has to go through this same process: First, indiscriminate chaos; then completely digested food or peptones; then protoplasmic mass; then the embryonal corpuscles out of which all the tissues arise, as exemplified by all reproduction of structure where there is fracture of the tissues. If they are favorably situated they simply repeat the embryonal condition and series of changes, so that they are indistinguishable from the original material.

Quite as mysterious is the fact that this minute cluster of molecules called a human germ—apparently a mere atom of jelly—not only comprises the beginning of all the vessels, tissues and organs of the matured body, but it brings forth the special characteristics of the parents, holding the potentiality of father and mother wherein heredity is involved, the mental and physical peculiarities, the general bent of disposition, the special traits, tastes, preferences and idiosyncrasies, and often the particular marks, growths, and physical and mental expression. Shakespeare says: "There's a divinity that shapes our ends, rough-hew them how we will." Can anyone doubt it?

Now, since we know that with judicious exercise and normal nutrition there will be normal growth and development, and consequently a normal body, we also know that with normal growth and development and a normal body, it naturally follows that there will be a normal reproduction; for, if the ancestor is normal, the offspring, which is a part of it, must be normal. But if any function of the organism is varied from the normal, it follows that the others will vary from the normal. If there is abnormal exercise, there will be abnormal nutrition; there being abnormal exercise and nutrition, there will be abnormal growth and development, and consequently an abnormal body. With all these abnormal conditions there will be abnormal reproduction; for, if the ancestor is abnormal, the offspring, which is a part of it, must be abnormal, and we call this heredity.

There is a mysterious principle in every living organism that enables it to select from its environment such ingredients as are necessary to produce the different tissues and organs peculiar to its own nature. Thus, if we plant a rose, or a lily, or a grain of corn in the same soil, and give them the same care, each one will select the ingredients from its environment that are essential to its growth and development, and with that subtle chemistry that is everywhere at work in the organic world, will produce its kind. This law holds good in the animal kingdom as well as among plants. If a number of animals of different species are taken in their infancy and subjected as nearly as possible to the same influences, it will be observed that each will develop into a distinct type, differing in almost every respect from the others. The observance of this law convinces us that the principle of each plant or animal, which enables it to preserve the peculiarities of its species, is an inherent principle which is part of its nature, inherited from its ancestors, and by it given to its offspring. Thus we have a universal law which enables each individual to transmit to its offspring certain essentials that are common to all the individuals of its species. Yet there are differences or peculiarities that distinguish each member of a species from all others. Now, how are we to account for these individual differences? This is

the province of heredity and environment. It is a well-known fact that no two persons are identical. It is also a self-evident fact that identical causes will produce identical effects, and that unequal causes will produce unequal effects. We know, too, that the latent powers, the latent possibilities that are concealed in each embryonic life, are variable quantities. We also know for a certainty that the influences which surround these individual lives—the environment—for moulding and shaping into a fixed state the plastic, latent, inherited predispositions are never identical. Therefore, in the question with which we have to deal, we have not only two unknown quantities, but two variable unknown quantities that are never the same or alike in two individuals—heredity and environment. Now, since there are no two persons with identical predispositions, what will be the result if we expose them to equal influences? Or the reverse: If we expose a number of persons of unequal predispositions to equal influences, the result must be unequal. If the environment is an uncongenial one, the person with an inheritance most approaching normal will possess the greatest power of resistance, and consequently will be the last to yield to malignant influences. The inverse of this is also true. Suppose, for instance, that all men were born equal, how long would they remain so if exposed to unequal influences? Dr. Weisman says: "We cannot, by excessive feeding, make a giant out of a dwarf, nor convert the brain of a fool into that of a Leibnitz, or a Kant, by means of much thinking." Spencer says: "There is no political alchemy by which you can get golden conduct out of leaden instincts. The inherited differences of individuals are known as individual predispositions. These predispositions render the individual more or less susceptible to external influences.

Heredity is therefore that law of nature whereby parents transmit to their offspring certain variable powers termed predispositions, which render their offspring more or less *susceptible* to their environment. Heredity is the condition within the body, and *environment* consists of the influences that act upon it from *without*. To properly adjust these two factors is the rationale of individual development and organic evolution. To balance some *inward* evil with some purer influence acting from *without*, will enable our environment to *correct* our heredity.

Every-day experience familiarizes us with the facts which are grouped under the name of heredity. *Every one of us bears* upon him obvious marks of his parentage, perhaps of remoter relationships. More particularly, the sum of tendencies to act in a certain way, which we call character, is often to be traced through a long series of progenitors and collaterals. So we may justly say, that this character, this moral and intellectual essence of a man, does veritably pass over from one fleshly tabernacle to another, and does really transmigrate from generation to generation. In the new-

born infant the character of the stock lies latent, and the ego is little more than a bundle of potentialities. But very early these become actualities. From childhood to age they manifest themselves in dulness or brightness, weakness or strength, viciousness or uprightness, and with each feature modified by confluence with another character, if by nothing else, the character passes on to its incarnation in new bodies. The Indian philosophers call this character karma.

The mysterious manner in which heredity performs its wonders is not yet known. But Sir James Paget said to his class, "We should not throw away what we do not understand." And Hippocrates, the Grecian physician and philosopher, said, "You will, as a rule, find that the form of the body and disposition of the mind correspond to the nature of the country."

The faculties of every animal depend on two causes: First, heredity, or those that have been evolved from the type and become fixed by succession through a long series of ancestors; secondly, adaptation, or those which are acquired by education, including *everything* that places the animal in harmony with its environment.

Let us now take a retrospective view of ancestral inheritances. As we do so, you will find a sympathetic chord has been touched in our nature, for a most melancholy vision is presented to us—diseased bodies, dwarfed and deformed; weak minds, so weak in fact that they cannot see truth, or if perchance they do see it, distort it till it is no longer truth; souls so black that they feast in darkness on the very dregs of perdition. What a vision to behold! And do we call these men? Men who were intended by the Great Creator of the universe to be the crowning piece of His handiwork! What a fearful manifestation of *penalties* for *broken* laws!

There are three causes that lead to all this depravity and misery, viz., an abnormal inheritance, an abnormal environment, and the improper use or abuse of our functions. If the fountain-head of the stream of life is not pure, we cannot expect the waters below to be pure. If in the laboratory of nature we combine two parts of hydrogen and one of oxygen, we call the resulting compound water; but, in the chemistry of life, if we combine two parts of immorality, which is moral depravity, one part of insanity, which is mental depravity, and two parts of disease, which is physical depravity, who can tell us what the product will be? Do we not have this identical problem to deal with in heredity? Every day of our lives we see this sad debauchery in chemistry, and the experimentation makes the world *shudder* to look at the *fearful results*.

If in the sacred laboratory of wedlock we combine these three ingredients, immorality, insanity, disease, we must remember that the laws of nature are never false. If the resulting compound is

not as we would have it, it is because the proper ingredients were not used. We must ever remember that, being in the midst of conflicting influences, it is impossible for man to remain in a state of equilibrium. In the rebellion of influences, the stronger will be victorious, and after each conflict he is either raised one step higher in the scale of life or descends one step lower. By yielding to degrading influences, man's powers are weakened, and he is rendered less able to battle with the lurking foes awaiting him. By yielding to ennobling influences his powers are strengthened, and he is led to still greater conquests.

If we would only make a wise selection of our environment, for, bear in mind, it is the circumstances of the environment from the cradle to the grave that determine our future destiny and a judicious use of our functions, we should always be found in the upward road to perfect development. But if we choose an abnormal environment and aid it by functional inactivity or functional excesses, we shall find, as we are carried downwards in the road to degeneracy, that our only blessing will be ignorance and immorality, poverty and disease. In all nature there are no evils without a remedy, if we but wisely seek it. So it is with evils of heredity. Nature furnishes poisons for the assassin; she also furnishes antidotes for the physician. As we deal with disease so should we deal with crime, as we cannot isolate either from heredity.

Children should be taught by wise mothers and fathers that ignorance of the laws of nature does not necessarily mean innocence in character; it is by *knowledge* that we gain power. A well-known gentleman has said, one who is born with such congenital incapacity that nothing can make a gentleman of him, is entitled, not to our wrath, but to our profoundest sympathy.

Those unfortunate victims who receive moral poisons from their ancestors, and those who receive bodies tainted with impurities, have no moral right whatever to entail upon helpless offspring the bitter fruits of their own ancestral sins. Such homes are the incubators for vice and moral depravity, and it is at their firesides that we find the congenital criminal.

It may appear rather a drastic measure, but there should be a gulf put between congenital criminals and the rest of mankind by means of compulsory celibacy, by isolating them from the world at large or by physiological annihilation,* which will render posterity safe from such contamination. The pure crystal streams of life should not be allowed to be polluted by the streams that flow into them, otherwise the waters of both will become con-

* Sexual perverts should not be allowed to procreate, and if the merciful act of asexualization was performed on all habitual criminals, it would not only relieve our gaols of more than half of the inmates but would make them industrious and useful citizens.

taminated. The ideal of a perfect physical nature is perfect health ; the ideal of a perfect mental nature is a normal brain ; the ideal of a perfect moral nature is a perfect conscience, and the ideal of a perfect being is the blending of these three into one symmetrical whole. A sound mind in a sound body should be the desire of all, and if we have lived in accordance with the natural laws of our constitution, the termination of our lives will have a peaceful and happy ending, when, the intellect unimpaired and the other senses uninjured, the same nature which put together the several parts of the machine, takes her own created work to pieces. In many cases the weary pilgrimage of life is brought to a close with little apparent derangement of mental powers ; the final scene may be short and painless, and the phenomena of dying almost imperceptible.

In such an ending the stock of nerve power is exhausted—the marvellous and unseen essence, that hidden mystery that man with all his wonderful powers of reasoning, that physiology with all the aid that science has lent it, and the genius of six thousand years has failed to fathom. In that hour is solved that secret, the mystery of which is only revealed when the book of life is closed forever. Then we may hope, when nature draws the veil over the eye that is glazing on this world, at the same moment she is opening to some unseen but spiritual eye a vista, the confines of which are only wrapped by the everlasting and immeasurable bounds of eternity.

Pope expresses this view of death most pathetically, when he says :

“ Vital spark of heavenly flame !
 Quit, oh quit this mortal frame !
 Trembling, hoping, lingering, flying,
 Oh the pain, the bliss of dying !
 Cease, fond nature, cease thy strife,
 And let me languish into life !

“ Hark ! they whisper ; angels say
 Sister spirit, come away !
 What is this absorbs me quite ?
 Steals my senses, shuts my sight,
 Drowns my spirits, draws my breath ?
 Tell me, my soul, can this be death ?”

"Cheap Jack" and Quackery.

By MARK G. MCELHINNEY, D.D.S., Ottawa, Ont.

The profession has a grievance. For a long time there have been heard sounds of complaint. At different times they have assumed various forms, but no one doubts the existence of a widespread and active evil. The Cheap Jack is the evil, he and his tribe. So accustomed have we become to it that we now almost believe it to be a necessary evil. When mankind cannot combat a wrong, he invariably labels it a "necessary evil." The writer has lately come to the conclusion that it is possible to greatly mitigate, if not to altogether eradicate, this evil, and henceforth refuses to believe that it is a necessary one.

There exists in almost every city a class of men calling themselves dentists and doing everything in their power to drag their profession down to the mire level of unskilled labor. They cut prices like rival insolvent dry goods houses, they haggle over prices like fish-wives, and finally accept the recompense of a corporation laborer.

They imagine that the profession has done them an injustice, that their confreres have slighted them, and consequently they endeavor to make it as unpleasant for their fellow-practitioners as possible. They continually have a grievance against the rest of the profession, and in retaliation they forget that it is their own noses that get cut.

There is a peculiar sensitiveness to slights and oversights that marks the *parvenu* and guttersnipe prince the world over, and the class in question possesses it to perfection.

The family that has known pinching poverty and whose immediate ancestors were strangers to refinement and station, often becomes, on accession to wealth, most noticeably disagreeable. Its members are rude to servants, fault-finding as to all services rendered, and open to insult by the most trivial oversight. This is because they are out of their element, and they know it and it irritates them accordingly. The profession of dentistry is rather too good company for some of those in it, and they, being unable to come up to its level, are endeavoring to bring it down to theirs.

Look at any Toronto paper and their trail can be seen all over. Toronto being the largest city within the jurisdiction of our college, it is the most cursed by the evil. According to their own story, there are men who never fail, men who can perform all operations painlessly, men who will guarantee their product for years; and

moreover, they will perform all this and much more for fees that are beyond comprehension for cheapness.

Yet so despicable in their meanness are these same men that they will not reveal these wondrous secrets of success to us their brethren. Being young my experience is limited, but it has not been too short to make the acquaintance of some of the experts of the profession and see some of their best efforts. It is beyond doubt that even these experts do occasionally fail, do even give pain sometimes and cannot conscientiously guarantee any work for even three days. One of the most skilful dentists in America has told me this in almost the same words. And further, these experts cannot afford to give their services for an office boy's wages. Those who advertise infallibility, painlessness, best material and workmanship "at rock-bottom prices," are merely liars seeking to gull the public.

They probably give the best material they can afford and the best workmanship of which they are capable, but neither, in the eyes of an expert, are cheap at half the money. The Cheap John knows how little his services are worth and charges accordingly. He is not to blame for he is the creature of his circumstances, nor can we hope to reform him, for he is without the incentive to self-advancement. He is also morally wanting, for he will appropriate to himself the processes and preparations that some reputable man has spent twenty years in perfecting, and this abominable parasite will next door, perhaps, parade them at half price, thus robbing the reputable man of his well-deserved reward.

Who is to blame for the existence of the charlatan? Who makes dentists? The School of Dentistry. Who founded the School? The College. Who constitutes the College? The profession at large. That means you and it means me and all of us. We, in fact, are to be blamed for our own degradation. Since quacks cannot be cured they must be prevented. Dentistry is one of the protected professions, and apart from the right of any class to protection, dentistry seems likely to be protected for some time.

Let us get what benefit we can from this protection while it lasts, for its days are perhaps numbered. The ultimate downfall of class legislation seems inevitable, then will it be re-introduced in a viler form—mass legislation. Class legislation has abuses, but mass legislation has not one redeeming feature. The profession of dentistry is in Ontario represented by the Royal College with its regulations and examiners. It is within the power of the college to pronounce upon the fitness or unfitness of a candidate. Let them do their duty and quackery will be stopped at the fountain-head. They cannot do that duty unless backed up by the solid sentiment of the profession. At present anyone may become a member of our profession if he can pay certain fees and

lie or cheat his way through examinations. It matters not how unsuitable or how immoral, how ill-bred or how useless. The laxity of the procedure in this respect is notorious.

We have cut a rod for our own backs. Our chickens are coming home to roost in the annual output of unsuitable persons. At the opening of the session the school gobbles up everything that can pay, and at the conclusion of the course vomits them forth upon the profession irrespective of all considerations whatever, and the manner of it offends our nostrils greatly.

It is not possible that out of a class of twenty-five or thirty students, picked at random from the schools, workshops and farms of Canada, each one can be a fit and proper person to practise a learned profession. It is probable that at least one-quarter of the number should be sent back.

There have been sessions at the conclusion of which every member graduated. There could be nothing worse for the honor of the profession. The general effect is demoralizing. Subsequent students cultivate carelessness. A reasonable number of "plucks" each session would produce a wholesome respect for the examinations and more careful attention during the term.

There would be fewer "Smart Alecks" and so-called "Dead game sports" in our ranks if the way were made a little more difficult. I am not one to find fault with anyone for having a good time. A cigar and a glass of beer are excusable occasionally, but if there is a kind of man that I detest it is one of those "sporty" students. He drinks to excess and brags eternally about it; swears loud, sings questionable songs likewise, and imagines that the whole female sex is at his feet because he has perchance overcome the scruples of some fifth-rate servant girl or been the favored lover of some wretched prostitute. This language is strong, but it is true and should be driven into unwilling ears with a speaking-trumpet. The members of the profession must be awakened to the necessities of the hour. It were time that the Augean stable of dentistry was purged of its uncleanness.

From the general expression of the joint meeting of the E. O. and the Ontario Dental Societies, some of the members, at least, are fully awake.

Let us carry the conflict into the enemy's country and either gloriously rescue our profession from infamy or perish in the general destruction, lost in the sink of quackery, charlatanism and incapability.

The ethics of a profession are second only to its educational attainments, and should, I believe, be a part of the student's indenture and of the final degree. Whoso will not uphold the dignity of the profession should lose his license. The profession in self-protection should be empowered to seize it and drive the offender forth, with stripes if need be. The five and eight dollar

plate man, the painless operator, the discoverer of nature's panacea (who probably does not know the chemical construction of water), and the low brute who insults women, whoever they be, in his chair are the natural and special enemies of every honest dentist, and should be treated accordingly. They do not develop these traits suddenly in after-life. They are the men who, in mistaken charity, the examiners allow to pass. They are the men who should be sent back whence they came.

I have at some length, perhaps, reviewed the evil; also to some extent hinted at a cure, or at least a means of prevention. The plan of campaign would be this—subject, of course, to additions and corrections by older and wiser heads:

For prevention—A more rigorous adherence to the percentage required to pass candidates, a stricter supervision to prevent cribbing, the doing of metal work for examination by persons other than the candidate, and recognition of the fact that a habitual drunkard and loafer, a man who will steal instruments and material from the college and his fellow-students, and a libertine, are not fit men to practise a respectable profession.

For cure—A general education of the public by the spreading broadcast of the knowledge that good services cannot be got for nothing. The best way to do this would be the issue of brief leaflets bearing the authority of the Association, and explaining in plain terms the exact relations between the dentist and the patient, and the different attitudes of the charlatan and of the reputable dentist toward these relations. There could be no better use for the funds of any association than the printing and distributing of knowledge of this kind; not only would it lessen the number of dupes, thereby starving out the quack, but it would call the attention of the general public to the matter, which attention could not but bring forth good results.

In this imperfect and disconnected way have I put down a few thoughts that occur and re-occur to me almost daily, trusting that in them may be found something useful and nothing altogether bad, for whatever may be faulty with my expression or my method, I feel that there is nothing wrong with the sentiment that calls for the preservation of the dignity of the dental profession.

To Utilize Old Gold Filling.

By G. V. N. RELYEA, L.D.S., Oswego, N.Y.

Gold fillings that have been doing good service for many years often become loose, either from slight decay or accident. We will suppose such a filling in either the incisors or cuspids, which the patient wants refilled. The party may not be willing or in circum-

stances to pay for another gold filling, and to fill with any other material may be out of the question. If the gold is in a solid condition, and other circumstances favorable, excavate what may be necessary, then mix a little phosphate very thin, line the cavity with it and place the old gold in its former position, gently press and hold it until the phosphate sets, and if kept dry by the rubber dam it will again do service for many years.

It is very perplexing to find that a full upper denture, after being prepared, has, in part, if not wholly, lost its adhesiveness. This I attribute to the expansion of the plaster, or hastily or carelessly removing it from the flask before being sufficiently cooled. To avoid against expansion, embed the plate in two-thirds of plaster *that has gone through the vulcanizer*. To guard against the latter, *take time*. To be a thoroughly successful dentist, be a painstaking one.

Proceedings of Dental Societies.

National Association of Dental Faculties.

The eleventh annual session of the National Association of Dental Faculties was held at the Hygeia Hotel, Old Point Comfort, Va., commencing Saturday, August 4, 1894, the president, Dr. H. A. Smith, of Cincinnati, in the chair.

The resignation of Dr. J. E. Cravens as secretary was accepted, and Dr. Louis Ottosy, of Chicago, was made secretary *pro tem*.

The following faculties were represented :

Baltimore College of Dental Surgery—B. Holly Smith.

Boston Dental College—J. A. Follett.

Chicago College of Dental Surgery—T. W. Brophy.

Harvard University, Dental Department—Thomas Fillebrown.

Kansas City Dental College—J. D. Patterson.

Missouri Dental College—A. H. Fuller.

New York College of Dentistry—Frank Abbott.

Ohio College of Dental Surgery—H. A. Smith.

Pennsylvania College of Dental Surgery—C. N. Peirce.

Philadelphia Dental College—S. H. Guilford.

State University of Iowa, Dental Department—W. O. Kulp.

University of Michigan, Dental Department—J. Taft.

University of Pennsylvania, Dental Department—Jas. Truman.

Vanderbilt University, Dental Department—H. W. Morgan.

Louisville College of Dentistry—F. Peabody.

Southern Medical College, Dental Department—C. V. Rosser.
 University of Tennessee, Dental Department—J. P. Gray.
 University of Maryland, Dental Department—F. J. S. Gorgas.
 Royal College of Dental Surgeons of Ontario—J. B. Willmott.
 Columbian University, Dental Department—H. C. Thompson.
 Northwestern University Dental College—G. H. Cushing.
 American College of Dental Surgery—Louis Ottogy.
 National University, Dental Department—J. Roland Walton.
 College of Dentistry University of Minnesota—T. E. Weeks.

The following schools were admitted to membership during the meeting :

Western Reserve University, Dental Department, Cleveland, O.
 —H. L. Ambler.

Western Dental College, Kansas City, Mo.—D. J. McMillen.

With reference to the application of Howard University, Dental Department, the Executive Committee recommended that in consequence of changes in and inadequacy of its dental department the application be rejected. The report was adopted.

The report of the Executive Committee recommending the admission of the University of Buffalo, Dental Department, to membership, was amended by the addition of the following clause, and then adopted: "When the honorary degrees conferred on Messrs. Southwick and Howard are returned to the university and revoked, and official notification of such revocation filed with the secretary of this association."*

The amendment to rule 5 offered by Dr. Hunt last year, making the rule read as follows, was adopted unanimously :

"(5.) **STANDING OF UNDERGRADUATES IN MEDICINE.**—Undergraduates of reputable medical colleges, who have regularly completed one full scholastic year, having attended at least seventy-five per cent. of a five months' term, and passed a satisfactory examination in the studies of the freshman year, may be admitted to the junior grade in colleges of this association, subject to other rules governing admission to that grade."

The following new applications for membership, with their recommendations, were reported by the Executive Committee :

Dental Department, Cleveland University of Medicine and Surgery, Cleveland, O. Recommended by Drs. J. Taft and J. E. Garretson.

Cincinnati College of Dental Surgery, Cincinnati, O. Recommended by Drs. James Truman, T. W. Brophy, F. J. S. Gorgas, and J. A. Follett.

* The Dental Department of the University of Buffalo complied with these conditions on August 13, 1894, and is therefore admitted into full membership.—**LOUIS OTTOGY**, Secretary.

Birmingham Dental College, Birmingham, Ala. Recommended by Drs. H. W. Morgan and C. V. Rosser.

University College of Medicine, Dental Department, Richmond, Va. Recommended by Drs. F. J. S. Gorgas and H. W. Morgan.

Atlanta Dental College, Atlanta, Ga. Recommended by Dr. H. W. Morgan and the faculty of the University of Tennessee, Dental Department.

The amendment to by-law 4, which was offered by Dr. Hunt last year, was laid on the table.

The resolution offered last year by Dr. Sudduth, directing the addition of Latin and physics to the entrance examination, was also laid on the table.

The special committee appointed last year to consider the matter of the vote of censure passed upon the Baltimore College of Dental Surgery reported, through its chairman, Dr. C. N. Peirce, recommending that no further action be taken. The report was adopted.

Dr. Louis Ottogy offered a recommendation, which was adopted, that all colleges, members of this association, shall increase the college course of 1895-96 to not less than six months.

The following resolution from the Executive Committee was adopted:

Resolved,—That any college or colleges making application for membership in the National Association of Dental Faculties shall be required to secure and present to the Executive Committee the approval and indorsement of the board of dental examiners of the State (where such boards exist) in which such colleges are located, before this application can be considered.

The following from the Executive Committee was laid on the table:

Resolved,—That we regard it as inconsistent for any member of a faculty of any college holding membership in this body to at the same time be a member of any State board of dental examiners.

The report of the *ad interim* committee with reference to charges preferred against the University of Maryland, Dental Department, was referred to the Executive Committee, which reported as follows:

“Your Executive Committee respectfully report that they find that the University of Maryland, Dental Department, in the reception of certain students did violate the regulations of this association, through a misapprehension of the rules, as it is interpreted, by your committee that the regular sessions of all colleges close with their commencement exercises.”

The report was adopted.

Dr. Guilford moved that rule 11, p. 12 of the “History,” be understood to mean that students coming from a college not a

member of this association will not be given credit for any time spent in such institution.

The annual dues were increased from \$3.00 to \$5.00 on motion of Dr. Cushing, the increase to take effect in 1895-96.

On motion of Dr. Truman, the special committee on preliminary examinations was instructed to have prepared by a competent person and present at the next annual meeting a list of questions of a standard covering every branch required in the grammar schools up to the point of admission to the high schools.

On motion of Dr. Abbott, it was ordered that each college should each year present its announcement, noting any changes, the secretary to note and publish all important changes in the annual report of the association.

On motion of Dr. Morgan, all the schools were required to comply with the rule regarding dissections.

On motion of Dr. Ottofy, a committee of three was appointed to revise the constitution and by-laws, with the further instruction, on motion of Dr. Truman, to drop the qualifying term "by."

The following were introduced, and under the rules lie over till next year :

By Dr. Peirce :

Resolved,—That, in view of the recommendation of the Executive Committee, this association will require that all colleges, members of this association, shall extend the term of the session of 1896-97, and of succeeding sessions, to not less than seven months each.

By Dr. Truman :

Resolved,—That on and after the session of 1898-99 the regular session of each of the colleges belonging to this association shall be extended to four years.

By Dr. Ottofy :

Beginning with the session of 1896-97, the examinations conducted by the colleges of this association shall be in the English language only.

By Dr. Ottofy :

Beginning with the session 1895-96, no college shall be permitted to retain membership in this association if it is conducted or managed, in whole or in part, by any person or persons who do not practise dentistry in accordance with well-recognized and generally accepted forms, generally known as dental ethics, or if they are owned in whole or in part by men or women who are engaged in disreputable dental practice, or if any college have upon its list of trustees, the faculty, demonstrators, or in any other capacity, any one who does not practise dentistry in accordance with the principles above mentioned. This shall refer to dentists only.

By Dr. Ottosy :

Beginning with the session of 1896-97, the following shall be the requirements for the admission of students to the colleges of this association :

a. A certificate of having successfully completed at least one full year's course of study in the collegiate department of any college or university registered by the regents of the State of New York as maintaining a satisfactory standard.

b. A certificate of having passed, in a registered institution, examinations equivalent to the full collegiate course of the freshman year, or to a completed three years' academic course.

c. Regents of the State of New York pass cards for any forty-eight counts.

d. A certificate of having passed the matriculation examinations of any university in Great Britain or Ireland, or of having completed a course of study recognized as an equivalent therefor.

e. A certificate of graduation from any registered gymnasium in Germany, Austria, or Russia.

f. A certificate of the successful completion of a course of five years in a registered Italian *ginnasio*, and three years in a *liceo*.

g. The bachelor's degree in arts or science, or substantial equivalents, from any registered institution in France or Spain.

h. Any credential from a registered institution, or from the government in any foreign state or country, which represents the completion of a course of studies equivalent to graduation from a registered New York high school, academy, or from a registered Prussian gymnasium.

By Dr. Gray :

Resolved,—That law 7 of the by-laws, which now reads "attendance upon three full courses of not less than five months each in separate years shall be required before examination for graduation," be amended by substituting "six" instead of "five," to take effect on and after the year 1896-97.

By Dr. Willmott :

Resolved,—That at least twenty-nine months intervene between the beginning of the freshman year and the date of graduation.

The Committee on Text-books presented the following report, which was adopted :

Your Committee on Text-books would report that only two works of this character have been presented for its consideration :

One, a work on "Dental Anatomy and Pathology," by Dr. C. F. W. Budecker, of New York, 700 pp.; and the other, a smaller and less pretentious work of about 75 pp., on "Operative Technics," by Dr. Thomas E. Weeks, of Minneapolis.

Both of these works are in press and nearly completed. The treatment of their subjects is full, clear and concise, and the illus-

trations numerous, well executed, and for the most part entirely new.

Your Committee would therefore recommend these two books for endorsement as text-books.

Suitable resolutions regarding the deaths of Drs. R. B. Winder and W. H. Eames were presented and adopted, and the secretary was instructed to communicate a copy to their respective families.

The following officers were elected for the ensuing year : Frank Abbott, president ; S. H. Guilford, vice-president ; Louis Ottofy, secretary ; H. W. Morgan, treasurer ; J. Taft, B. Holly Smith and Thomas Fillebrown, executive committee ; James Truman, Truman W. Brophy and Francis Peabody, *ad interim* committee.

Dr. Abbott, the newly-elected president, was installed, and appointed the following committees :

Committee on Schools—J. A. Follett, F. J. S. Gorgas, Louis Ottofy, C. N. Peirce and Truman W. Brophy.

Committee on Text-books.—J. D. Patterson, A. O. Hunt, J. B. Willmott, T. E. Weeks and J. P. Gray.

Adjourned.

Editorial.

Splendid Work of the National Association of Dental Faculties.

If our readers were as familiar with the record on dental education of the old *Canada Journal of Dental Science* as they may perhaps be with that of its successor, the *Dominion Dental Journal*, they would realize that if the editorial views therein expressed are not admitted by our American cousins to have been influential, they were, at least, prophetic. It goes against the grain to toot one's own "bazoo": recent controversy not only justifies the reference, but the action last month of the National Association of Dental Faculties, which we print elsewhere, is an official confirmation, by the representatives of the schools, of the position occupied in Canada for many years.

When the profession was organized in Ontario, one of the first recommendations was for the exaction of a classical and mathematical standard of entrance to study. After a while this became an accomplished fact, and to this day, in Ontario and the Province of Quebec, at least, the standard is equal to that required for the entrance to the study of medicine. This matriculation is con-

ducted by experts beyond the control of the Dental Boards, and it is now impossible to evade it. Without an immediate prospect of establishing a college, the method of study was modelled chiefly upon the British system of apprenticeship, and compulsory attendance upon special lectures in medical schools. This indentureship had many advantages, which no college course could ever supplant. It had disadvantages which only a college course could remove. It worked uncommonly well when the student found a skilled and faithful tutor. It worked uncommonly bad when the reverse was the case. No doubt there are brilliant people around, who think that if they had been on hand, Rome could have been built in a day; but the "bazoo" is not a national instrument in Canada, and if there were such self-confident architects in our profession they did not file an appearance and our profession made haste slowly. The studentship was made to cover the twelve months of four successive years. Certified tickets of dissection and of regular attendance upon the medical lectures was demanded. When the first college was organized in Toronto, compulsory attendance was required. The difficulties in the way were gradually removed. The "bazoo" was never blown. It is not the fashion of the country. We do not expect to set the St. Lawrence on fire, but we hope to do good work in our own sphere for our Dominion, and are perfectly willing to believe that our good cousins over the border can largely supplement for our students, from their greater resources, all that we can do towards clinical and practical instruction.

One resolution in particular affects Canada as directly as any State in the American Union. We cannot too emphatically express our gratitude for the generosity of our neighbors in according to us one form of annexation, which is much more popular than the political. We refer to the admission of Canadian colleges to the privileges of the National Association of Dental Faculties. By this thoroughly kind action the degree of D.D.S. of the University of Toronto, and we hope to add some day that of the Province of Quebec, is as acceptable for practice as that of the American colleges. It widens the scope for our students, though we hope they will all find fields in our own Dominion. It will be observed that the Association now demands the approval and indorsement of the Boards of Examiners where the colleges are located, in order to secure membership. The chances of factious opposition are thus destroyed, as students will not care for degrees which are not recognized as equivalent to those of the best colleges, and the Boards will not likely indorse rival institutions founded for no other reason than miserable jealousy or spite.

The National Association of Dental Faculties has merited the utmost confidence of the profession. It has the future of Dentistry *on this continent* in its keeping. Its enemies, if there are any, must be the enemies of moral ethics, as well as of professional progress.